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ABSTRACT

The purpose of this paper is to examine the function of memory as an underlying psychological process in human communicative behavior by offering a theoretical framework derived from communication literature. Divided into two sections, the paper deals with "The Psychology of Memory: Some Basic Propositions," which reviews the literature on the capacity and limitations of human information processing abilities, and "A Functional Model of Memory in Communication," which details a theoretical model of the role of memory in human communication and includes a schematic drawing to facilitate understanding. (RB)

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A FUNCTIONAL MODEL OF MEMORY IN COMMUNICATION

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As the fourth of the traditional five canons of Classical Rhetoric, the concept of memory has been a part of communication literature for well over 2,000 years. A critical review of communication literature (e.g., King, 1968), however, reveals that its understanding has scarcely improved with age. Historically, it has been the product of memory in terms of (verbatim) memorization rather than the process in terms of remembering which has received the most attention from communication scholars, while attempts to examine the concept as anything much beyond an adjunct of speech presentation have been extremely rare. Few writers, it seems, have considered its role in the more fundamental act of creating or inventing discourse, although it would obviously seem to be important. If anything, in fact, it is often assumed to be important in communication because it is difficult to describe the process without it. Essentially, this reflects a behavioristic, "black box" approach to the matter, where one observes communicative effects (e.g., the results of invention) and then infers what must have caused them.

What appears to be missing in all of this is an explicit, viable psychology of memory in communication; a theory of what memory "is" and what it "does" for a communicator, and perhaps equally important of how and why it "does what it does." Phrased somewhat differently, the customary treatment of memory in communication literature leaves several questions partially or totally unanswered: how does a person use his memory in communication? what influence, if any, does it have upon his communicative effectiveness? what factors affect, or can be used to predict, its operation in the generation of discourse? In short, what is the function of memory as an underlying psychological process in human

communicative behavior? Put simply, it is the purpose of this paper to try and shed light on these issues by offering what is hopefully a sound theoretical framework for their analysis.

The Psychology of Memory: Some Basic Propositions

A theory of memory's function in communication, of course, must logically rest upon a theory of memory's function per se. Ideally, such a theory would result in a number of basic "conclusions" about the memory process which could then be applied to the process of communication, providing an answer to the questions above. Unfortunately for the sake of clarity, the psychological literature of memory is complex, multifaceted, and often contradictory, and it is difficult to summarize without distortion. Yet drawing upon a considerable body of past and present research findings (King, 1973), it seems possible to list the following propositions as generally indicative of memory's function:

(1) As a System of Information Processing, the Capacity of Memory is Limited. As a rule, the acquisition of information exceeds its (conscious) retention and its retention exceeds its (voluntary) recall. This discrepancy is enhanced and perhaps even precipitated by the postulated existence of two different "compartments" of memory storage: short-term memory and long-term memory (Adams, 1967; Norman, 1969). The presumed necessity for information to pass from one compartment to the other, and the fact that the capacity of STM is considerably smaller than that of LTM, is a basic reason for the loss of information, or forgetting.

(2) Forgetting Results Primarily from an Inability to Retrieve rather than to Retain Previously Learned Information. Viewed simply as an

ability to hold or contain information, it is possible that the capacity of (long-term) memory is unlimited, or at least beyond measurement. Viewed as an ability to contain information in a form available to voluntary recall, however, it appears that the capacity of memory is severely limited. The customary explanation is that items in memory are subject to interference from other items which can have the effect of extinguishing their response capabilities over time (Adams, 1967). Thus, the process of remembering consists largely of finding ways to access stored information, or to minimize the influence of interitem interference, particularly as it relates to the transfer of items from STM to LTM.

(3) Retrieval is Improved through the General Processes of Organization and Association of Verbal Material. The principles of organization and association are fundamental to the study of memory and include numerous sub-principles of their own (Mandler, 1967). Central to the concept of association, however, is the assumption that recollection involves a "chaining together" of ideas (or items), so that the recall of one leads naturally to the recall of another. In this way, a large number of ideas can presumably be united, or organized, into a coherent whole.

(4) Organization and Association are Most Effective when They Proceed on a Hierarchical Basis. A critical point in the process of association is that associated items tend to organize themselves into categories on the basis of some common, generic property, and that items within a category are hierarchically ordered from superordinate to subordinate. This is of profound significance to the task of remembering, for it means that a single, superordinate item can trigger the recall of all of the other items in a category, and thus make it possible to recall a large

number of items by working through a relatively small number of categorical "headings" or labels (Nelson, 1969). In a sense, the labels seem to act as a stimulus for recall, supplying a "starting point" for the progressive association of items from superordinate to subordinate. As such, they also serve as a means of "tagging" or "indexing" items, providing a method of locating them in memory storage (Shepard, 1966).

(5) Organization may Constitute a Method of Coding Material, and Material may be Recoded to Enhance Its Organizational Properties. Among the most significant extensions of the concept of organization is that it represents a means of "coding" material in memory, broadly defined as a process of "structuring" or "systematizing" items for aid in the task of recalling them. The importance of this is that given the value of organization, it is possible to recode material in ways which increase its organization -- and so its recall. The reason for the effectiveness of such procedures is likely to lie in the fact that they permit the same amount of information to be packaged into fewer items, and thus less must actually be remembered (Miller, 1956). This has special relevance to the problem of bridging the gap between STM and LTM, for it also permits more information to be packaged into a given number of items, thereby increasing the amount which can be remembered.

(6) Coding/Recoding Reflects and Attempt to Engender Meaning in Material. A basic proposition in the study of memory is that meaningful material is normally retained and recalled better than nonmeaningful material. The explanation for this is that meaningful material can draw upon past language learning, can benefit from positive transfer of training

from past "patterns of retaining," and so simplify a rememberer's task by providing a preestablished "format" for responding to the material (Hunter, 1964). The role of recoding in this process is apparent when we note that recoding increases the meaningfulness of material by allowing it to be characterized in ways which reflect one's past language learning. Underlying this principle is the fundamental assumption that the act of (verbal) mediation increases meaning, and indeed that mediation may even be responsible for the meaningfulness of material (Montague, Adams, and Kiess, 1966). In a subtler, more complex manner, the issues of mediation and meaning also relate to the transfer of items from STM to LTM, for it seems that material may pass directly into LTM (or at least pass more swiftly and surely through STM) if it can be associated in some meaningful way with material already well-learned.

(7) Coding/Recoding may be Facilitated by the Use of Imagery. Although not as well-understood as many other facets of memory, the concept of imagery -- particularly visual imagery -- is a staple element in the memory process. As Paivio (1971) has suggested, imagery serves as an alternate method of coding material in memory, providing, along with language, both a verbal and a nonverbal mode of organizing stored information. Its usefulness seems to run parallel to that of language, fulfilling many of the same tasks with many of the same results. For example, it seems that imagery enhances the meaningfulness of material, largely because it acts as a mediator for items (Bugelski, Kidd, and Segmen, 1968; Johnson, 1970). It seems further that imagery increases the efficiency of dealing with material, largely because it allows items to be formed into larger "chunks" (see Miller, 1956) which, like verbal code

words, can then be used to retrieve the items "within" them. When compared to language, there is reason to believe that imagery represents a rather primitive mode of coding information, but this does not preclude the possibility that it may serve as a powerful adjunct to verbal coding, supplying a remembered with a valuable source of additional details on items in memory storage.

(8) Retrieval is Improved through Rehearsal of Material. This is a deceptively simple proposition, for it is not rehearsal itself which is important in remembering but what a person is doing during rehearsal (Hunter, 1964; Adams, 1967, Norman, 1969). And what he is doing, it appears, is forming associations between items (or perhaps more properly searching for associations from his past language learning) which permit him to organize material in meaningful ways. Thus, rehearsal increases the tendency of items to formsinto categories and also increases the meaningfulness of material. As a consequence, it is a primary factor in the reduction of interitem interference as well as in the transfer of items from STM to LTM. In short, then, rehearsal exerts a pervasive influence on the memory process, acting as a catalyst for a number of critical operations.

(9) Both the Quality and Quantity of Retrieval are Affected by Motivational Factors. As important as organization and association are to remembering, it seems that retrieval is also affected by certain nonassociative or motivational factors (Weiner, 1966). Regrettably, the subject of motivation occupies a vague position in the literature of memory, and too little is currently known about it. Under the guise of "interest," "concentration," etc., traditional views have held it responsible for

the presence of "individual differences" in remembering, and for the fact that remembering is notoriously selective; people tend to remember best what they "want" or "need" to remember. In this regard, it is commonly acknowledged that motivation can reduce as well as increase remembering, particularly in cases where the term forgetting is replaced by the term repressing (Hunter, 1964: 231-249). In any event, however, the principle of motivation is consistent. And as Weiner (1966) has suggested, perhaps the best way to characterize its effect is to say that it may help or hinder the processes of organization and association, determining how well and to what extent these activities are carried out.

(10) Memory is Reconstructive rather than Reproductive in Nature. The ultimate outcome of organization, association, and coding is the emergence of a generalized plan for remembering, defined by Miller, Galanter, and Pribram (1960: 16) as ". . . any hierarchical process in the organism that can control the order in which a sequence of operations is to be performed." An important implication of this idea is that remembering functions according to a set of "instructions" or "rules" stored in memory which guide the individual to the location and retrieval of a designated item (Brown and McNeill, 1966; Pollio and Garow, 1968). A second, more important implication, however, is that except in the case of isolated and discrete bits of material these "instructions" are seldom perfect; the item retrieved is rarely the same as the item originally perceived, or acquired. The primary reason for this is that in the process of coding material in meaningful ways new items are "modified" to conform with one's past experience. Thus, as Bartlett's (1932) classic work

maintains, the plan one follows in remembering is more a procedure for reconstructing than for reproducing material. Far from being an infallible guide to the replication of a past event, it is actually a means of recreating -- or perhaps even creating ---it in the context of other events in memory storage.

A Functional Model of Memory in Communication

In review, it would certainly be presumptuous to maintain that these ten propositions identify all of the variables which may influence the memory process, let alone the variety of causes, conditions, and consequences which may underlie them. In a sense, any discussion of memory which confines itself to retention and recall must be somewhat artificial, for it ignores the critical interface between memory and a number of other cognitive activities, most notably perception, attention, and learning. Assuming, however, that these propositions are valid, that they identify variables which must be considered if not all of the variables which could be considered, it now seems possible to address the task of relating, as it were, the "psychology" of memory to the "psychology" of communication.

Fortunately, a readily available context for such a task may be found in the modern trend towards viewing communication as a series of interdependent systems for information processing: intrapersonal, interpersonal, and public/socio-cultural (e.g., Mortensen, 1972). Within this framework, the activities of retention and recall would naturally seem to be included among the basic cognitive elements in the process of

communication within the individual. More specifically, in answer to the question of what memory "does" in communication, it appears possible to say that it serves at least three broad purposes: (1) it acts as a repository for the experiences, concepts, and words (the rhetorician's "available means of persuasion") which are the raw materials of speech invention; (2) it acts, in connection with the processes of thinking and reasoning, as a setting for linking experiences and concepts with words to produce oral expression, or the generation and transmission of a message; (3) perhaps most important, it acts as a vehicle for interpreting and evaluating messages, and for determining how one should respond to them. This last feature, of course, has significance for interpersonal and public as well as intrapersonal communication, for it suggests that memory is instrumental in determining one's response to the messages of another. To the extent, therefore, that memory is central to human information processing, it would seem to be a critical factor in both transmitting and receiving and in determining the effects of a message on the behaviors of speakers and listeners.

This being true, the key issue then becomes how memory functions in communication, or how it influences speaker-listener behavior. Here, it is possible to draw upon our ten propositions to construct a functional model of memory in communication as indicated in figure 1. The core of the model is Waugh and Norman's (1965) illustration of primary memory and secondary memory, but it may be noted that the model also incorporates concepts from several current models of (intrapersonal) communication (e.g., Ross, 1970; Wiseman and Barker, 1967), which can easily be fitted, in whole or in part, within it. Briefly, the major components of the

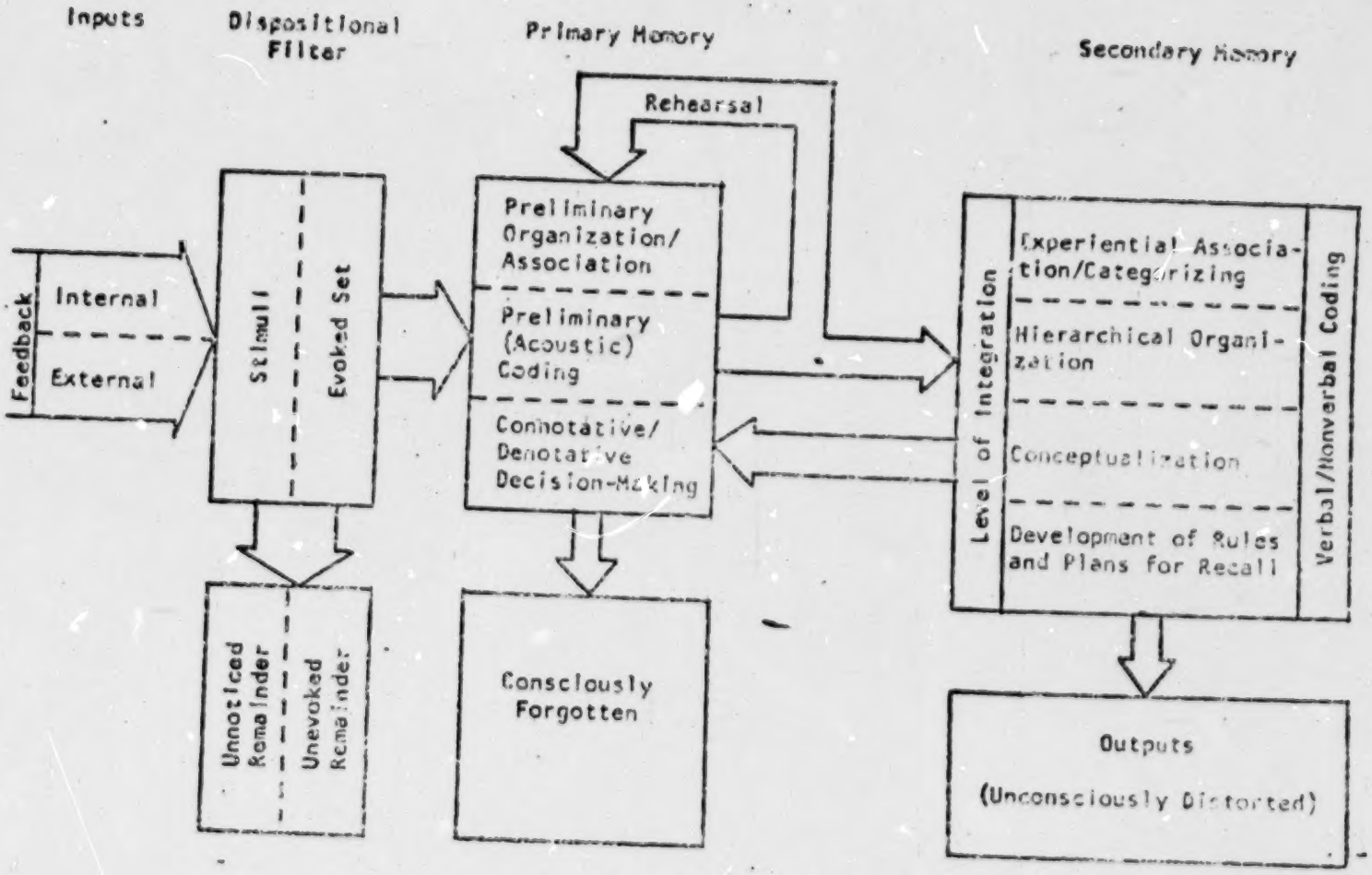

Figure 1. A Functional Model of Memory in Communication.

model are as follows, with a short explanation/elaboration of each of them:

(1) Inputs. Divided into "internal" and "external" sources, these represent all of the information potentially available to a communicator, whether as a sender or as a receiver, at any given moment. They include environmental stimuli available through the mechanisms of sensation and perception as well as the attitudes, values, feelings, etc. which make up what March and Simon (1958) have termed the "internal state" of an individual at a given point in time. As both of these sources affect the response of a communicator in any particular situation, they are generally classified as forms of feedback, or "internal and external indicators and signs" which guide one's subsequent behavior (Ross, 1970). Presumably, the existence of various communicative channel factors could also be classified as feedback-inputs, along with the possibility of physical and/or psychological noise in communication.

(2) Dispositional Filter. As feedback is received by an individual it passes through a "dispositional filter," the primary function of which is to discriminate among incoming stimuli, helping to select from the information potentially available that which is actually available to a communicator. Operant here is the general mechanism of attention in information processing, and the idea that only a fraction of all incoming information can be apprehended by an individual at any one time. Borrowing a concept from March and Simon (1958), information which is apprehended reflects a combination of environmental stimuli plus an "evoked psychological set" for an individual at the moment the stimuli are perceived. This psychological set, composed of knowledge, emotions, and expectations derived from previous learning, determines which of the available stimuli

will be perceived and which will be essentially ignored as the "unnoticed remainder." Additionally, it helps to determine which of the possible responses (or interpretations) to stimuli will be employed and which will be ignored as the "unevoked remainder." In the case of typical communicative exchange between two persons, therefore, it is likely that only a portion of the information transmitted by one will really be apprehended by the other, and vice versa. Significantly, for both individuals the information which is apprehended is likely to be that which conforms with one's psychological set, or which fits one's pattern of expectations and prior knowledge.

(3) Primary Memory. The tendency for an individual to receive information selectively is enhanced by the operation of primary, or short-term memory. The central purpose of primary memory is to act as a "buffer" between sensation/perception and secondary (or long-term) memory, holding new items of information in temporary storage for later processing into more permanent storage. As the capacity of primary memory is relatively small rehearsal is necessary to preserve new items there, and items which are not rehearsed are quickly forgotten -- at least consciously. The result of rehearsal is to build associations between new items and items already well-learned, permitting new items to remain in primary memory as well as to be transferred into secondary memory. Thus, it appears that primary memory is responsible for the preliminary organization of new information and for its preliminary coding/recoding. Important but not indicated in the model is the possibility that some information may be recalled directly from primary memory and that some information, if easily associated with information already well-learned, may seem to pass directly into secondary

memory. Like the process of dispositional filtering (to which it is functionally related), therefore, the movement of information through primary memory is a critical element in communication, for essentially primary memory serves as a decision-making unit, determining what information is available for further processing by a communicator, what is recalled immediately, and what is effectively eliminated from further consideration.

(4) Secondary Memory. As the logical end-product of information storage, secondary memory is the ultimate determiner of what information is available to a communicator in the generation/reception/interpretation of discourse. In the context of thinking and reasoning, it contributes to what Wiseman and Barker (1967) have labeled the "ideation and incubation" stage of communication, as well as to the encoding and decoding of ideas in the form of messages (Mysak, 1970). It does this through the complicated process of associating and categorizing experiential data, of forming this data into organizational hierarchies and concepts, and of developing systems of rules and plans for accessing the data in the way of recall. Fundamental to these activities is the role of verbal and nonverbal coding, for the basis of organization and association is actually symbolic, between words or images which represent experiences and can therefore be used to express them. Of significance is the fact that coding engenders meaning to information, and that meaningfulness depends upon the integration of new information into the structure of information already acquired. This feature explains the dynamicsinterplay between primary memory and secondary memory, i.e., the fact that new information is retained faster and better when it can be worked easily into a matrix of past language habits and experiences, yet it also explains why the "outputs" from

secondary memory are often (unconsciously) distorted. As a result of various motivational factors combined with the seemingly inescapable need to "alter" information to conform with one's past experiences, the information retrieved, to use an earlier phrase, is rarely the same as the information perceived.

Regrettably, this model suffers from the same drawback of all two-dimensional models of process, namely the inability to express the concept of simultaneity. It is likely that the flow of information through a communicating individual does not proceed in the orderly, linear fashion the model implies, but rather that the phases we have discussed are operating concurrently. It is also likely that in practice these phases are not nearly as distinct as the model implies, but that there is considerable overlap among them. Nevertheless, there is reason to believe that in some form and to some extent these phases are operant in every communicative act. By now, therefore, the value of the model for trying to establish memory's function "as an underlying psychological process in human communicative behavior" is hopefully apparent. By tracing the flow of information through a communicating individual, it attempts to touch upon a number of essential cognitive operations in communication, operations which affect both the process and the product of communicative interaction.

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